

Scoring Guide - Score Point 3

The respiratory system starts when you inhale oxygen and bring it to the lungs. From there the oxygen diffuses into capillaries and into the blood stream. This is when the circulatory system takes over. The oxygen molecule in the blood is brought to the muscles. The oxygen diffuses into a muscle cell and is sent to the mitochondrion. This is when the muscular system comes in since it is in a muscle cell. It here in the cell where the oxygen will help get energy to muscles and the rest of the body. Oxygen helps to keep the muscles working and not feeling tired.

Scoring Guide - Score Point 2

When you breath in oxygen all parts of the body uses it. The respiratory system gives oxygen to the blood. The heart pumps the blood thraugh body, including the muscles. The muscles use the oxygen and supply it to the mitochondria of the cell.

Scoring Guide - Score Point 1

The Respiratory system brings the Oxygen into the body. The Circulatory System carries the Oxygen to where it is needed. The muscular System does something else.

Scoring Guide - Score Point 0

The respiratory, circulatory and muscular systems interact to transport a molecule of oxygen from the air to a mitochondrion because ATP gives more energy and you lose oxygen when you exercise.

Scoring Guide - Score Point 4

The first step of this process is the oxygen entering the body through the respiratory system. When the human breaths, the oxygen enters through the mouth or nose and goes into the lungs. Once the oxygen enters the lungs, it enters tiny air sacs called alveoli, and waits there to be transported further. The oxygen then enters the blood stream, also known as the circulatory system, by exiting the alveoli. This oxygen travels in the blood stream until it reaches a muscle cell. When it gets there, it is transported through the cell membrane into the cell. From there, it is taken in to the mitochondrion within the cell, and used to be converted into ATP for the process of cellular respiration. This is how a molecule of oxygen is transported from the air to a mitochondrion.

Scoring Guide - Score Point 4

First, every time a person breathes they take air into their body. During exercise, the breathing rate speeds up so that more air can be taken in. In the lungs, the air is filtered and the oxygen molecules in it taken out to be used in the process of respiration. The lungs pass this oxygen to red blood cells in the capillaries passing through them. These blood cells are now oxygenated and pass through the circulatory system's arteries, pumped by the heart, which, during exercise, like the respiratory system, works twice as hard as usual so that the oxygenated blood cells pass quickly through the body. Once the oxygenated red blood cells reach the muscle cells involved in the exercise, they release the oxygen they were carrying. This oxygen passes through the muscle cell's cell membranes in the process of diffusion - in this way, the cell doesn't have to expend extra energy in order to receive a material needed to produce energy. The oxygen moves to the mitochondria, where it is used in the process of respiration to take some compounds and produce  $H_2O$  and, most importantly, ATP, which is then used in exercise.

2007. Biology - High School

Question 39: Open-Response

Reporting Category: Anatomy and Physiology

Standard: Anatomy and Physiology - B 4.8

When a person exercises, the rate of cellular respiration increases to supply the body with more energy in the form of ATP. Mitochondria require oxygen to carry out cellular respiration.

Describe how the respiratory, circulatory, and muscular systems interact to transport a molecule of oxygen from the air to a mitochondrion. Be sure to discuss all three systems in your response.



2009, Biology - High School  
Question 6: Multiple-Choice  
Reporting Category: Anatomy and Physiology  
Standard: Anatomy and Physiology - B 4.7

Nerve cells use which of the following to communicate with each other?

- A. antibodies
- B. electrochemical signals
- C. enzymes
- D. simple sugars

2007, Biology - High School  
Question 31: Multiple-Choice  
Reporting Category: Anatomy and Physiology  
Standard: Anatomy and Physiology - B 4.5

Which of the following is one of the functions of the human skeleton?

- A. producing hormones
- B. bringing gases into the body
- C. removing waste from the body
- D. providing a site for blood cell formation

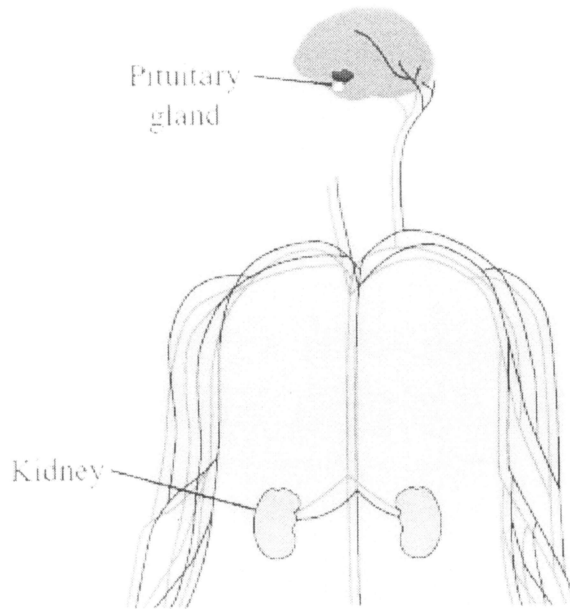
2008, Biology - High School

Question 27: Multiple-Choice

Reporting Category: Anatomy and Physiology

Standard: Anatomy and Physiology - B 4.7

The diagram below shows the locations of the pituitary gland and the kidneys in the human body.



The pituitary gland can release a substance into the bloodstream that signals target cells in the kidneys to reabsorb more water. The released substance is an example of

- A. an enzyme.
- B. a hormone.
- C. a neurotransmitter.
- D. a vitamin.

2009, Biology - High School

Question 37: Multiple-Choice

Reporting Category: Anatomy and Physiology

Standard: Anatomy and Physiology - B 4.8

High levels of carbon dioxide in the blood trigger which of the following responses in the body?

- A. an increase in the rate of digestion
- B. an increase in the rate of breathing
- C. a decrease in the speed of the pulse
- D. a decrease in the production of sweat

2009, Biology - High School  
Question 35: Multiple-Choice  
Reporting Category: Anatomy and Physiology  
Standard: Anatomy and Physiology - B 4.6

Shelly and Jason are siblings, but Shelly looks like their father while Jason looks like their mother. Which of the following statements best explains the difference in Shelly's and Jason's features?

- A. Shelly inherited a greater number of chromosomes from their father than Jason did.
- B. Shelly inherited a smaller number of X chromosomes from their mother than Jason did.
- C. Shelly and Jason had different mutations occur in the 46 chromosomes they inherited from their mother and father.
- D. Shelly and Jason inherited different combinations of 23 chromosomes from their mother and 23 chromosomes from their father.

2007, Biology - High School  
Question 41: Multiple-Choice  
Reporting Category: Anatomy and Physiology  
Standard: Anatomy and Physiology - B 4.8

Which of the following is the best example of an organism maintaining homeostasis?

- A. a wolf panting after a chase
- B. a spider catching an insect in a web
- C. a cricket becoming infected by a virus
- D. a mole digging tunnels in the ground

Reporting Category: Anatomy and Physiology  
Standard: Anatomy and Physiology - B 4.6

In sexual reproduction, what is the source of the genetic material in a zygote?

- A. an egg cell only
- B. a sperm cell only
- C. an egg cell and a sperm cell
- D. an egg cell and a polar body

2007, Biology - High School  
Question 44: Multiple-Choice  
Reporting Category: Anatomy and Physiology  
Standard: Anatomy and Physiology - B 4.4

Which of the following is the basic structural unit of the nervous system?

- A. axon
- B. neuron
- C. red blood cell
- D. white blood cell

2009, Biology - High School  
Question 30: Multiple-Choice  
Reporting Category: Anatomy and Physiology  
Standard: Anatomy and Physiology - B 4.4

Which of the following statements best compares sensory neuron function and motor neuron function in the human body?

- A. Sensory neurons are voluntarily controlled, whereas motor neurons are involuntarily controlled.
- B. Sensory neurons respond to light and sound stimuli, whereas motor neurons respond to touch stimuli.
- C. Sensory neurons send signals to motor neurons, whereas motor neurons send signals to the central nervous system.
- D. Sensory neurons send signals to the central nervous system, whereas motor neurons receive signals from the central nervous system.

2008, Biology - High School

Question 31: Multiple-Choice

Reporting Category: Anatomy and Physiology

Standard: Anatomy and Physiology - B 4.3

Which of the following is a correct order in which air moves through the human respiratory system when a person inhales?

- A. nose, larynx, trachea, pharynx, bronchi, lungs
- B. nose, pharynx, larynx, trachea, bronchi, lungs
- C. pharynx, bronchi, nose, larynx, trachea, lungs
- D. pharynx, nose, trachea, bronchi, larynx, lungs

2009, Biology - High School

Question 42: Multiple-Choice

Reporting Category: Anatomy and Physiology

Standard: Anatomy and Physiology - B 4.3

Emphysema is a severe respiratory system disease. The disease causes damage that directly prevents the transfer of oxygen to the bloodstream.

Which part of the respiratory system does emphysema damage?

- A. alveoli
- B. bronchi
- C. larynx
- D. trachea

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2007, Biology - High School

Question 18: Multiple-Choice

Reporting Category: Anatomy and Physiology

Standard: Anatomy and Physiology - B 4.2

Capillaries are part of which body system?

- A. skeletal system
- B. nervous system
- C. digestive system
- D. circulatory system

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2008, Biology - High School

Question 14: Multiple-Choice

Reporting Category: Anatomy and Physiology

Standard: Anatomy and Physiology - B 4.2

Which of the following organs removes extra water from the blood to keep the amount of fluid in the bloodstream at the proper level?

- A. kidneys
- B. liver
- C. pancreas
- D. stomach

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2008, Biology - High School

Question 9: Multiple-Choice

Reporting Category: Anatomy and Physiology

Standard: Anatomy and Physiology - B 4.2

Unlike dairy milk, soymilk provides some of the body's daily requirement for iron. In which of the following functions of the human body does iron serve a primary role?

- A. conducting nerve impulses
- B. strengthening bone structure
- C. causing muscle fibers to contract
- D. helping transport oxygen in the blood

The digestive system is responsible for breaking down food and converting it into nutrients the body can use. Food begins to break down in the mouth by chewing as well as enzymes excreted by glands in the mouth. Food then travels down the esophagus into the stomach. From the stomach, food goes to the intestines. It is here that nutrients are absorbed by the body. Carbohydrates are converted into energy for the body. Proteins build and restore muscle. After the body removes nutrients from the food, it leaves the body through the excretory system.

b. Nutrients in the digestive system are made available to cells throughout the body through blood. One of the most important nutrients in blood is iron. Nutrients can also be stored in muscle throughout the body. Nutrients that are overly abundant and cannot be stored, leave the body through the excretory system.

a. Once carbohydrates, proteins, and fats are taken in through eating, they travel down the digestive system where they are used throughout the body. The carbohydrates, proteins, and fats from food enter through the mouth as milk or soy milk, they travel down the esophagus to the stomach, then to the small and large intestines, they are then excreted through the anal canal. In the small intestine nutrients are absorbed. Carbohydrates are used as energy, proteins are broken down into amino acids, which are used in DNA and RNA, and fats are broken down into fatty acids. Fatty acids are used to build cell membranes.

b. The energy from carbohydrates is carried through the body by the circulatory system, to the muscular system where they are used in cellular respiration. Proteins and amino acids are also carried through the circulatory system, because every cell needs amino acids for DNA and RNA. All cells also need fatty acids so they are also carried through the circulatory system. This system includes the heart, veins, arteries, and capillaries.



Scoring Guide - Score Point 4

- a. The digestive system converts carbohydrates, proteins, & fats into nutrients. Protein digestion begins in the stomach, where pepsin breaks protein into peptides. In the start of the small intestine, the pancreas, liver & gall bladder all secrete chemicals that continue the break down of protein & also break down carbohydrates & fats. Bile is one thing secreted by the liver & gall bladder. Amylase is another enzyme that comes from the pancreas. By the end of the small intestine, the carbs, fats & proteins are all broken into small things like monosaccharides, fatty acids & amino acids, respectively.
- b. Nutrients are made available to the body after digestion occurs. This happens in the small intestine. In the small intestine are tiny protrusions called villi. These have finer protrusions on them called microvilli. These microvilli/villi have capillaries in them (small blood vessels). The nutrients are absorbed into the capillaries. This leads to the bloodstream, which transports nutrients to other body cells.

Scoring Guide - Score Point 1

- a) The digestive system first takes in the food through the mouth into the large intestines. There the food is broken down and enters the small intestines. In the small intestines the food is further broken down and the nutrients are absorbed into the body.
- b) The nutrients are made available because certain carrier enzymes transport the food to storage cells where it waits to be used when needed.

- a. Carbohydrates are converted into usable monosaccharides during chemical digestion in the mouth, where the enzyme amylase is produced. This process is continued in the small intestine to digest more complex molecules such as starch. Proteins are broken down into single amino acids in the stomach and the enzyme pepsin, and then in the small intestine which reduces the fragments of proteins into single units. Fats are digested only in the small intestine. Bile is secreted through the hepatic duct from the gall bladder to prevent the fat from condensing into an undigestible mass. Lipase then breaks the lipids down into glycerine and fatty acid monomers.
- b. Once nutrients travel through the small intestine and are completely digested, they are absorbed by the villi and microvilli carpeting the intestinal wall. Capillaries are located in the interior of the villi and microvilli that connect to the circulatory system and convey the digested nutrients to cells. There are also vessels that absorb fat molecules and transport them directly into the lymphatic system for use. Once nutrients enter the circulatory system, they are carried throughout the body and enter cells by diffusion, facilitated diffusion, or active transport. Excess glucose is temporarily stored in the liver as glycogen for short term energy should cells have need of it.

## Scoring Guide - Score Point 0

a.) The amount of carbohydrates, proteins, and fats are converted into nutrients by storing the amino acids in the mitochondria and the ribosomes for the cells to use later on if they need it.

b.) The nutrients can be broken down to fit in certain parts of the cell for it to help maintain its structure

The digestion of dairy milk or soymilk provides the body with important nutrients.

1. Describe how the digestive system converts the carbohydrates, proteins, and fats in dairy milk or soymilk into nutrients that can be used by cells. Include the body parts and organs involved.
2. Describe how the nutrients in the digestive system are made available to cells throughout the body after digestion has occurred. Include the body parts and organs involved.

Milk is an important part of many people's diets. When the word milk is mentioned, most people think of dairy milk derived from cows. Many people, however, cannot drink dairy milk because of lactose intolerance. Individuals with this condition are unable to digest a component in the milk called lactose. Lactose is the sugar in dairy milk. It is a disaccharide made from the sugars glucose and galactose. Lactose-intolerant individuals lack the enzyme lactase, which is needed for the digestion of lactose sugar.

Many lactose-intolerant individuals drink soymilk instead of dairy milk. Soymilk is produced from soybeans (the seeds of the soybean plant) and is a nutritious substitute for dairy milk. Soymilk contains protein, calcium, and other essential nutrients just as dairy milk does.

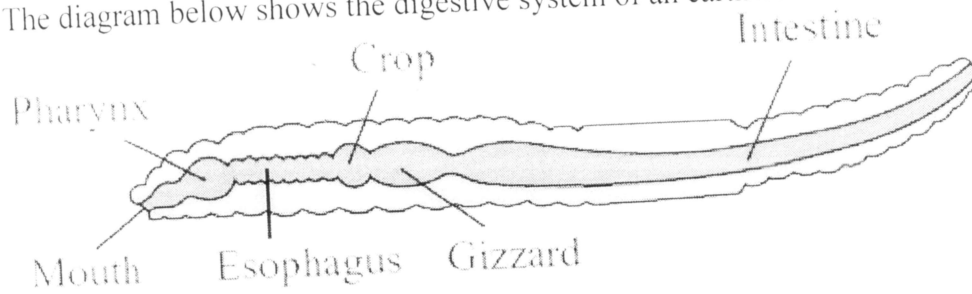
The table below compares some of the nutrition information for a serving of dairy milk and a serving of soymilk.

Dairy Milk and Soymilk Nutrition Information

Serving size	Whole Dairy Milk		Unsweetened Soymilk	
	Amount per Serving	% Daily Value	Amount per Serving	% Daily Value
8 oz (240 mL)	150		90	
Total fat	8 g	12%	4 g	6%
Saturated fat	5 g	25%	0.5 g	3%
Cholesterol	35 mg	11%	0 mg	0%
Sodium	125 mg	5%	85 mg	4%
Total carbohydrates	12 g	4%	4 g	1%
Sugars	12 g		1 g	
Protein	8 g	16%	7 g	14%
Vitamin A		6%		10%
Vitamin C		10%		0%
Vitamin D		25%		30%
Calcium		30%		30%
Iron		0%		6%

2009, Biology - High School  
Question 32: Open-Response  
Reporting Category: Anatomy and Physiology  
Standard: Anatomy and Physiology - B 4.1

The diagram below shows the digestive system of an earthworm.



- Identify three digestive organs in the earthworm that are also found in the human body.
- Describe the function that each organ you identified in part (a) has in the human body.

2009, Biology - High School  
Question 33: Multiple-Choice  
Reporting Category: Evolution and Biodiversity  
Standard: Evolution and Biodiversity - B 5.1

Scientists have concluded that snakes evolved from an ancestor with legs.  
Which of the following statements provides the best evidence for this conclusion?

- Most species of snakes live on land.
- Snakes move extremely fast to catch their prey.
- Snakes have a well-developed backbone and muscular system.
- Some species of snakes have limb buds during their embryonic development.

2007, Biology - High School  
Question 2: Multiple-Choice  
Reporting Category: Anatomy and Physiology  
Standard: Anatomy and Physiology - B 4.1

What is the primary function of the large intestine?

- to digest proteins
- to absorb nutrients
- to break down complex carbohydrates
- to remove water from undigested waste